From FAIR Data to Educational Impact: A Digital Resource Advancing Heritage Science Research and Learning

Ioana Maria Cortea
National Institute of Research and Development for Optoelectronics
INOE 2000, Măgurele, Romania
ioana.cortea@inoe.ro

ABSTRACT

The INFRA-ART Spectral Library is a FAIR-aligned, open-access digital repository designed to support research, education, and conservation in heritage science [1,2]. Developed at the National Institute for Research and Development in Optoelectronics (Romania), the INFRA-ART database provides access to high-quality (multi)spectral datasets linked to a wide range of material samples found in artworks and archaeological objects.

While the INFRA-ART Spectral Library was initially developed as a standalone data service, its transformation toward a FAIR-aligned and EOSC (European Open Science Cloud) integrated resource has been a central focus in recent years. Early challenges included limited machine-actionable metadata, lack of persistent identifiers, and low interoperability with other platforms. These gaps were progressively addressed through a series of initiatives—including participation in two support actions under the FAIR-IMPACT EU project—focused on strengthening repository visibility, metadata quality, and alignment with the EOSC Interoperability Framework [3,4]. These efforts led to measurable improvements in the repository's FAIR maturity, including a significant increase in its F-UJI FAIR level assessment score [5].

Beyond serving as a data source for specialists, the INFRA-ART Spectral Library has evolved into an educational platform that promotes open science practices and hands-on learning. As part of the OPEN-SciART project [6], the repository is now being enriched with openly available educational content designed to foster digital and scientific literacy across interdisciplinary fields (heritage conservation, spectroscopy, and material science). These include a growing series of blog posts, learning articles, and tutorials focused on:

- Spectral data analysis and interpretation: introducing students and early-career researchers to the principles and practicalities of working with analytical techniques used in heritage diagnostics.
- Material characterization: highlighting case studies and workflows for identifying pigments, binders, and historical materials.
- FAIR data practices: offering clear explanations and real-world examples of how to implement the FAIR (Findable, Accessible, Interoperable, Reusable) principles in research workflows.
- Data stewardship and policy guidance: helping users navigate licensing, metadata standards and best practices for managing research data in alignment with the FAIR principles and the EOSC guidelines.

These materials are being developed as FAIR educational resources—with embedded metadata and persistent identifiers to ensure they are discoverable, accessible, and reusable within digital learning environments. Through these enhancements, the INFRA-ART Spectral Library is evolving into a more inclusive, transparent, and interoperable digital backbone for heritage science. This work offers a replicable model for transforming specialized repositories into open, FAIR-enabled educational platforms that support interdisciplinary learning, equitable access, and professional development.

CCS CONCEPTS

• Applied computing → Education → E-learning

KEYWORDS

FAIR data, FAIR implementation, open science, open-access research infrastructure, digital library, educational resources, data literacy

ACKNOWLEDGMENTS

This work was funded by a grant of the Ministry of Research, Innovation and Digitization, CNCS - UEFISCDI, project number PN-IV-P2-2.1-TE-2023-2019, within PNCDI IV.

REFERENCES

[1] INFRA-ART Spectral Library, https://infraart.inoe.ro/
[2] Ioana Maria Cortea, Alecsandru Chiroșca, Laurențiu Marian Angheluță, George Serițan. 2023. INFRA-ART: An open access spectral library of art-related materials as a digital support tool for cultural heritage science. *ACM Journal on Computing and Cultural Heritage*, 16, 2 (June, 2023), 40. DOI: https://doi.org/10.1145/3593427.
[3] FAIR-IMPACT support action: Testing the trustworthy and FAIR-enabling repositories prototype.
[4] FAIR-IMPACT support action: Creating EOSC compliant interoperability policies based on EOSC Interoperability Framework (IF).
[5] F-UJI Automated FAIR Data Assessment Tool, https://www.f-uji.net/
[6] OPEN-SciART - A Tailored-Made Open-Access Spectral Data Analytics Application for Heritage Science, Education, and Conservation (Research Projects for Young Independent Teams, PN-IV-P2-2.1-TE-2023-2019), https://open-sciart.inoe.ro/